

ET151R BASIC ELECTRONICS AND MEASUREMENT TECHNIQUES

Teaching Scheme:03L

Credit: 03

Evaluation Scheme: 30 MSE +10 ISA+60 ESE

Total Marks: 100

Duration of ESE: 03 Hrs

Course Description

This course provides knowledge about basic analog electronics components to familiarize students with construction, their working, operation, performance and applications. This course also provides knowledge about measuring instruments and standards alongwith coverage of active and passive electronic components used in measuring circuits.

Course Outcomes

Upon successful completion of this course the students will be able to:

1. demonstrate operating principles of basic semiconductor devices like diodes, bipolar junction transistors and operational amplifiers.
2. compute various parameters of rectifier circuits and op-amp-based amplifier circuits.
3. demonstrate the knowledge of system units, classification and essentials of measuring instruments.
4. identify, and select a suitable sensor or transducer for given application.

The relevance of POs and strength of co-relation

[illegible]

Course Content

Diode Circuits: p-n junction diode and Zener diode, regulated power supply-introduction, block diagram and parameters, rectifiers- operation and derivations of rectifier parameters for half, full and bridge wave rectifier, Filters - necessity, types

Transistor: Bipolar Junction Transistors (BJT): Basic concept, working, Transistor configurations and their V-I characteristics (CB, CE and CC), alpha, beta and gamma and their inter-relation, DC load line analysis, Q-point and its significance. Introduction to Field Effect Transistor (FET)

Operational Amplifier (Op-amp): Introduction, symbol, block diagram, parameters, ideal Op-amp, Op-amp configurations- inverting, non-inverting and differential (open loop and closed loop), applications- adder, subtractor.

Fundamentals of Measurements: Block diagram of measurement system, types of errors, significance of electrical measurement system, various electrical effects employed in measuring instruments, static and dynamic characteristics of measuring instruments, classification of measuring instruments.

Measuring Instruments: Introduction to electrical measurements: Classification of analog instruments, Galvanometers and d'Arsonval type. Principle of operation, construction of PMMC, moving iron-extension ranges of ammeters, voltmeters, ohmmeter and multimeter, cathode ray oscilloscope and its basic applications.

Transducers: Definition-transducer and sensor, classification of transducers, characteristics and selection criteria, RTD, thermistor, LVDT, potentiometer, strain gauge transducers. Level transducers- resistive, pressure transducer-bourdon tube.

Text Books

1. Electronic Principles, A. Malvino, D. J. Bates, 7th edition, Tata McGraw Hill Education Private Limited, 13th reprint, 2012.
2. Electronic Instrumentation and Measurement Techniques, A. D. Helfrick and W.D. Cooper, Eastern Economy Edition, PHI Learning Pvt. Ltd., New Delhi, 2008.
3. Op-amps and Linear Integrated Circuits, R. A. Gaykwad, 4th edition, Pearson Education, 2015.

Reference Books

1. A Course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, 8th edition, Dhanpatrai and Sons, 2002.
2. Instrumentation Measurements and Analysis, B. C. Nakra and K. K. Chaudhry, Tata McGraw Hill Education, 2nd edition, 2004.
3. Electronic Instrumentation and Measurements, H. S. Kalsi, McGraw Hill Education Private Limited, 4th edition, 2022.

ET152R BASIC ELECTRONICS AND MEASUREMENT TECHNIQUES LAB

Teaching Scheme:02PR Total: 02

Evaluation Scheme: 50 ICA

Credit: 01

Total Marks: 50

Course Description

This course provides knowledge about basic analog electronics components to familiarize students with construction, their working ,operation, performance and applications. This course also provides knowledge about measuring instruments and standards. It also gives introduction to measuring instruments It also covers the active and passive electronic components used in measuring circuits.

Course Outcomes

Upon successful completion of this course the students will be able to:

1. demonstrate the practical knowledge of electronic circuits using diodes, bipolar junction transistors and operational amplifiers.
2. compute experimentally various parameters of rectifier circuits and op-amp-based amplifier circuits.
3. operate measuring instruments like multimeter and cathode ray oscilloscope (CRO).
4. develop experimental skills on sensor/transducer based circuits.

The relevance of POs and strength of co-relation

[illegible]

Course Content

Minimum ten experiments shall be performed to cover entire curriculum of course ET151R, five from group A and B each. The list given below is just a guideline.

- | | |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group A | <ol style="list-style-type: none">1. V-I characteristics of p-n junction diode2. V-I characteristics of Zener diode3. Zener diode as voltage regulator4. Half wave and full wave rectifiers and plot its output waveform5. Capacitor input filter and plot its output waveform6. Transistor (BJT/FET) input/output characteristics7. Transistor as a switch8. Inverting and Non-inverting Op-amp9. Voltage follower/adder/subtractor using Op-amp |
| Group B | <ol style="list-style-type: none">10. To study different meters available in laboratories11. Study of PMMC Instruments12. Temperature measurement using RTD13. Displacement measurement using LVDT14. Design and implementation of series and shunt ohmmeters15. Measurement of pressure using C type bourdon tube16. Study of front panel controls of CRO17. Measurement using CRO18. Component testing using CRO |